

Executive Summary

<http://www.epa.gov/oar/aqtrnd98/chapter1.pdf>

Criteria pollutants are those pollutants for which the United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS). They include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), and sulfur dioxide (SO₂).

This is the twenty-sixth annual report documenting air pollution trends in the United States.¹⁻²⁵ This document highlights the Environmental Protection Agency's most recent assessment of the nation's air quality, focusing on the 10-year period from 1989 to 1998. It features comprehensive information for the criteria pollutants and hazardous air pollutants, as well as relevant ambient air pollution information for visibility impairment and acid rain.

Discussions throughout this report are based on the principle that many of the programs designed to reduce ambient concentrations of the criteria pollutants also aid in reducing pollution that contributes to air toxics pollution, visibility impairment, and acid rain. Likewise, requirements under the various air toxics, visibility, and acid rain programs can also help reduce emissions that contribute to ambient concentrations of the criteria pollutants.

CHAPTER 2

CRITERIA POLLUTANTS — NATIONAL TRENDS

Percent Decrease in National Air Quality Concentrations 1989–1998

| | |
|--|----|
| Carbon Monoxide | 39 |
| Lead | 56 |
| Nitrogen Dioxide | 14 |
| Ozone* | 4 |
| Particulate Matter (PM ₁₀) | 25 |
| Sulfur Dioxide | 39 |

* based on 1-hour level.

Air quality concentrations are based on actual measurements of pollutant concentrations in the air at selected monitoring sites across the country.

Fine particulate matter, or PM_{2.5}, are those particles whose aerodynamic size is less than or equal to 2.5 micrometers.

EPA tracks trends associated with the criteria pollutant standards. The national and regional air quality trends, along with supporting emissions data, are presented in this chapter. National average air quality has improved from 1989 to 1998 for all the criteria pollutants.

While the national trends have improved over this 10-year period, trends in some areas, including rural locations, have worsened. Ozone concentrations, for example, have increased at 17 of the 24 National Park Service sites with trend data. Increases at nine of those sites are statistically significant. The 1998 levels were particularly high at two parks in the eastern United States, Shenandoah and the Great Smoky Mountains. Ozone levels at these sites were the highest in a decade and 30–40 percent higher than the national ozone standard.²⁶ Fine particle concentrations have also increased in some areas in the rural East. PM_{2.5} concentrations increased at 7 of the 10 rural eastern sites with trend data from 1992 to 1998. During that same period, average PM_{2.5} levels in the western United States decreased 5 percent.

On July 18, 1997, EPA revised the ozone and particulate matter standards following a thorough scientific review process. In May 1999, however, the U.S. Court of Appeals for the D.C. Circuit issued an opinion affecting these revised standards. In particular, the court remanded the ozone standard back to EPA for further consideration. The court also vacated the revised PM₁₀ standard and remanded the PM_{2.5} standards back to EPA for further consideration. Following the denial of a petition for a rehearing by the D.C. Circuit, the Justice Department has filed a petition for review before the Supreme Court. See

Special Report Chapter 2 features a special report on the impact of major wildfires on U.S. air quality.

Chapter 2 for trends relating to the revised ozone and PM NAAQS and refer to <http://www.epa.gov/airlinks/> for up-to-date information concerning actions surrounding the revised standards.

CHAPTER 3

CRITERIA POLLUTANTS—
METROPOLITAN AREA TRENDS

| Summary of MSA Trend Analyses, by Pollutant | | | | | |
|---|-------------------------|-----------------|--------------|--------------------------|----------------------------------|
| Trend Statistics | | Total # MSAs | # MSAs Up | # MSAs Down Change | # MSAs with No Significant |
| CO | Second Max 8-hour | 139 | 0 | 104 | 35 |
| Lead | Max Quarterly Mean | 90 | 1 | 61 | 28 |
| NO ₂ | Arithmetic Mean | 97 | 4 | 44 | 49 |
| Ozone | Fourth Max 8-hour | 198 | 13 | 25 | 160 |
| Ozone | Second Daily Max 1-hour | 198 | 11 | 23 | 164 |
| PM ₁₀ | Weighted Annual Mean | 211 | 1 | 152 | 58 |
| PM ₁₀ | 90th Percentile | 211 | 0 | 132 | 79 |
| SO ₂ | Arithmetic Mean | 148 | 0 | 103 | 45 |
| SO ₂ | Second Max 24-hour | 148 | 0 | 91 | 57 |

Chapter 3 characterizes air quality on a more local level, using three different indicators. First, this chapter lists the 1998 peak air quality concentrations for metropolitan areas. Second, ten-year trends are assessed for each area using a statistical method to measure whether the trend is up or down. The results show that 21 areas had a statistically significant upward trend in ambient concentrations for at least one criteria pollutant, while 221 areas had a statistically significant downward trend for at least one criteria pollutant. The third way in which local air quality is evaluated is by looking at the Air Quality Index (AQI) in the nation’s 94 largest metropolitan areas. The AQI analysis

shows that between 1989 and 1998 the total number of “unhealthy” days decreased an average of 57 percent in southern California (which, for the purposes of this analysis, includes the Los Angeles, Riverside, Bakersfield, and San Diego), but actually rose 10 percent in the remaining major cities across the United States.

CHAPTER 4

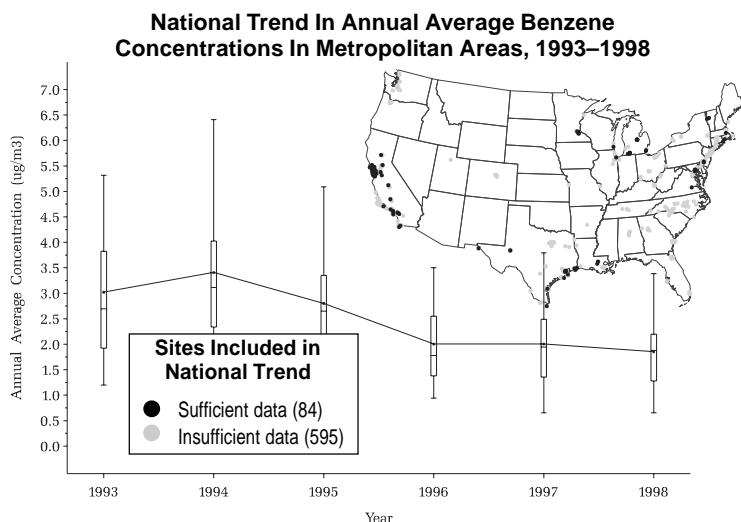
CRITERIA POLLUTANTS—
NONATTAINMENT AREAS

| Nonattainment Status | | | |
|----------------------|---------------------|-----------------|-------------------------|
| | Original # areas | 1999 # areas | 1999 Pop. (in 1000s) |
| CO | 43 | 20 | 33,230 |
| Pb | 12 | 8 | 1,116 |
| NO ₂ | 1 | 0 | 0 |
| O ₃ | 101 | 32 | 92,505 |
| PM ₁₀ | 85 | 77 | 29,880 |
| SO ₂ | 51 | 31 | 4,371 |

Chapter 4 summarizes the current status of nonattainment areas, which are those areas not meeting the NAAQS for at least one of the six criteria pollutants. Under the Clean Air Act Amendments (CAAA) of 1990, there were 274 areas designated nonattainment for at least one ambient air quality standard. As of September 1999, 121 areas are designated nonattainment. These areas are displayed on a map in this chapter. A second map depicts the current ozone nonattainment areas, color-coded to indicate the severity of the ozone problem in each area. The condensed list of nonattainment areas as of September 1999 is presented in Table A-17. This table is also on the Internet at <http://www.epa.gov/airs/nonattn.html> and is updated as areas are redesignated.

CHAPTER 5

AIR TOXICS



Chapter 5 presents information on another set of air pollutants regulated under the CAA. Hazardous Air Pollutants (HAPs), commonly called air toxics, are pollutants known to cause or suspected of causing cancer or other serious human health effects or ecosystem damage. The CAA lists 188 such pollutants and targets the sources emitting them for regulation. Examples of air toxics include mercury, chromium, benzene, and perchloroethylene (“perc”). Air toxics are emitted from literally thousands of sources, including familiar sources like electric utilities, automobiles, and dry cleaners.

In 1990, Congress amended Section 112 of the CAA by adding a new approach to the regulation of HAPs. This new approach is divided into two phases. The first requires the development of technology-based emissions standards for sources of the

188 HAPs. The second phase is to evaluate remaining problems or risks and develop additional regulations to address sources of those problems as needed.

The success of the Air Toxics Program depends on our ability to quantify the impacts of air toxics emissions on public health and the environment. To that end, EPA has initiated numerous National Air Toxics Assessment (NATA) activities to help identify areas of concern, characterize risks, and track progress. These activities include expanded air toxics monitoring, improving and periodically updating emissions inventories, national- and local-scale air quality and exposure modeling, and continued research on effects and assessment tools.

Currently, there are approximately 300 monitoring sites producing ambient data on HAPs. EPA is working together with state and local air monitoring agencies to build upon these monitoring sites to develop a monitoring network which is representative of air toxics problems on a national scale. EPA’s Photochemical Assessment Monitoring Stations (PAMS) also measure HAPs among the many pollutants that are precursors of ozone. Although these existing data sources are limited in their geographic scope, they still provide useful information on the trends in ambient air toxics. The results generally reveal downward trends for most of the monitored HAPs. The most consistent improvement is apparent for benzene, which is predominantly emitted by mobile sources. Benzene decreased 37 percent from 1993 to 1998, with much of the reduction occurring between 1994 and 1996. This reduction is due, in large part, to the use of reformulated gasoline.

CHAPTER 6

VISIBILITY TRENDS

The CAA authorizes EPA to protect visibility, or visual air quality, through a number of programs. In 1987, the Interagency Monitoring of PROtected Visual Environments (IMPROVE) visibility monitoring network was established as a cooperative effort between EPA, National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish & Wildlife Service, and state governments. The objectives of the network are to establish current conditions, to track progress toward the national visibility goal by documenting long-term trends, and to provide information for determining the types of pollutants and sources primarily responsible for visibility impairment.

The trends analyses presented in this chapter are based on data from the IMPROVE network. There were 34 sites having data adequate for assessing trends between 1989 and 1998. Because of the significant regional variations in visibility conditions, the trends are grouped into eastern and western regions, rather than a national aggregate. The trends are presented in terms of



the annual average values for the “clearest,” “typical,” and “haziest” days monitored each year.

The results show that, in general, visibility is worse in the east than in the west. In fact, the worst visibility days in the west are only slightly more impaired than the best days in the east. The 10-year trends show that visibility in the west has improved slightly for all three ranges (clearest, typical, and haziest days), while visibility in the east does not seem to be improving for any of the ranges. In fact, eastern visibility impairment on the haziest days has worsened from 1997 to 1998, and the Great Smoky Mountains National Park experienced its worst vis-

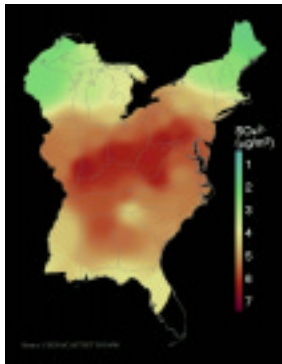
ibility in more than a decade.

In April of 1999, EPA issued the final regional haze regulation. This regulation addresses visibility impairment in national parks and wilderness areas that is caused by numerous sources located over broad regions. The program lays out a framework within which states can work together to develop implementation plans that are designed to achieve “reasonable progress” toward the national visibility goal of no human-caused impairment in the 156 mandatory Class I federal areas across the country. Implementation of the PM and Ozone NAAQS in conjunction with a future regional haze program is expected to improve visibility in urban as well as rural areas across the country.

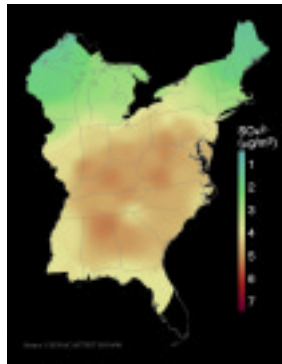
CHAPTER 7

ATMOSPHERIC DEPOSITION OF SULFUR AND NITROGEN COMPOUNDS

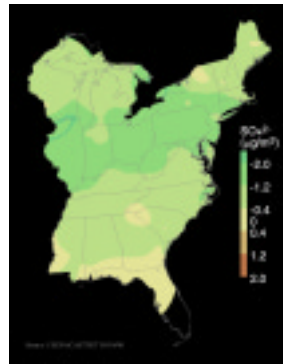
Comparison of ambient sulfate concentrations in the rural eastern United States from CASTNet monitoring data, 1990–1991 vs. 1997–1998.



1990–1991



1997–1998

Decrease in ambient sulfate
concentrations in the rural
eastern United States,
1990–1991 vs. 1997–1998.

Acidic deposition or “acid rain” occurs when emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) in the atmosphere react with water, oxygen, and oxidants to form acidic compounds. These compounds fall to the Earth in either dry form (gas and particles) or wet form (rain, snow, and fog). Some are carried by the wind, sometimes hundreds of miles, across state and national borders. In the United States, about 64 percent of annual SO_2 emissions and 26 percent of NO_x emissions are produced by electric utility plants that burn fossil fuels.

The National Atmospheric Deposition Program/National Trends Net-

work (NADP/NTN) and the Clean Air Status and Trends Network (CASTNet), two monitoring networks described in detail in the chapter, monitor wet and dry acid deposition, respectively. NADP/NTN consists of nearly 200 sites nationwide, while CASTNet contains 79 sites. These sites monitor a number of compounds, including sulfates and nitrates, which are formed from SO_2 and NO_x reacting in the atmosphere.

Wet deposition data from the NADP/NTN show that sulfate concentrations in precipitation have decreased over the past two decades. In 1995 and 1996, concentrations of sulfates in precipitation over a large area of the eastern United States exhibited a dramatic and unprecedented reduction. Sulfates have been estimated to be 10–25 percent lower than levels expected with at continuation of the 1983–1994 trend. This important reduction in acid precipitation is directly related to the large regional decreases in SO_2 emissions resulting from phase I of the Acid Rain program (see the SO_2 section in Chapter 2 for more details). Nitrate concentrations in recent years at the NADP/NTN sites are not appreciably different from historical levels.

Dry deposition data from the CASTNet sites in the eastern rural United States show that average sulfate concentrations decreased 22 percent between 1989 and 1998. However, a 10-percent increase in average sulfate concentrations occurred between 1997 and 1998. Most of the increase occurred during the second and third calendar quarters. Between these warmer months of 1997 and 1998, regional sulfur dioxide emissions increased 12 percent and average sulfate concentrations increased 21 percent. The higher summertime emissions in 1998 are attributed, in part, to the extra demand on electric utilities due to extremely warm temperatures throughout the Southeast.

The trend in nitrate concentrations is essentially flat, corresponding to the small change in NO_x emissions during this period. The highest nitrate concentrations are found in Ohio, Indiana, and Illinois, while the highest sulfate concentrations are adjacent to the Ohio Valley and in northern Alabama, which correspond to the locations of large electric utilities.

REFERENCES AND NOTES

1. *The National Air Monitoring Program: Air Quality and Emissions Trends-Annual Report*, EPA-450/1-73-001a and b, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, July 1973.
2. *Monitoring and Air Quality Trends Report*, 1972, EPA-450/1-73-004, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, December 1973.
3. *Monitoring and Air Quality Trends Report*, 1973, EPA-450/1-74-007, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, October 1974.
4. *Monitoring and Air Quality Trends Report*, 1974, EPA-450/1-76-001, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, February 1976.
5. *National Air Quality and Emissions Trends Report*, 1975, EPA-450/1-76-002, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, November 1976.
6. *National Air Quality and Emissions Trends Report*, 1976, EPA-450/1-77-002, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, December 1977.
7. *National Air Quality and Emissions Trends Report*, 1977, EPA-450/2-78-052, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, December 1978.
8. *1980 Ambient Assessment-Air Portion*, EPA-450/4-81-014, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, February 1981.
9. *National Air Quality and Emissions Trends Report*, 1981, EPA-450/4-83-011, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, April 1983.
10. *National Air Quality and Emissions Trends Report*, 1982, EPA-450/4-84-002, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, March 1984.
11. *National Air Quality and Emissions Trends Report*, 1983, EPA-450/4-84-029, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, April 1985.
12. *National Air Quality and Emissions Trends Report*, 1984, EPA-450/4-86-001, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, April 1986.
13. *National Air Quality and Emissions Trends Report*, 1985, EPA-450/4-87-001, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, February 1987.
14. *National Air Quality and Emissions Trends Report*, 1986, EPA-450/4-88-001, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, February 1988.
15. *National Air Quality and Emissions Trends Report*, 1987, EPA-450/4-89-001, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, March 1989.
16. *National Air Quality and Emissions Trends Report*, 1988, EPA-450/4-90-002, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, March 1990.

17. *National Air Quality and Emissions Trends Report*, 1989, EPA-450/4-91-003, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, February 1991.
18. *National Air Quality and Emissions Trends Report*, 1990, EPA-450/4-91-023, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, November 1991.
19. *National Air Quality and Emissions Trends Report*, 1991, EPA-450/R-92-001, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, October 1992.
20. *National Air Quality and Emissions Trends Report*, 1992, EPA-454/R-93-031, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, October 1993.
21. *National Air Quality and Emissions Trends Report*, 1993, EPA-454/R-94-026, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, October 1994.
22. *National Air Quality and Emissions Trends Report*, 1994, EPA-454/R-95-014, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, October 1995.
23. *National Air Quality and Emissions Trends Report*, 1995, EPA-454/R-96-005, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, October 1996.
24. *National Air Quality and Emissions Trends Report*, 1996, EPA-454/R-97-013, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, January 1998.
25. *National Air Quality and Emissions Trends Report*, 1996, EPA-454/R-97-013, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, January 1998.
26. Based on the level of the 8-hour ozone standard (0.08 ppm).

